minute, and by holding his breath at the rate of 27 per minute. Other experiments show, however, that the power does not consist in any change in breathing, nor does it depend on increased blood pressure, voluntary motion, nor, according to the subject, on the fixation of any emotion or idea. The change of rate seems to be effected by a series of impulses which gradually weaken in force; the power to produce these is also easily exhausted. The subject, as seems general in such cases has a certain power over the ear muscles and others not commonly under control.

On the Observation of Sudden Phenomena. S. P. LANGLEY. Amer. Jour. of Sc. XXXVIII, 93, Aug. 1889.

Reference was made in an earlier number of this JOURNAL (II, 24) to a device of Prof. Langley's for excluding personal equation in transit observations. He now presents a simple and ingenious instrument for practically excluding it in the observation of sudden phenomena (*e. g.* the emergence of stars from the dark limb of the moon, etc.). The detail of the instrument must be seen in the original; but in general it depends on the introduction of a double total-reflection prism, revolving in the axis of the instrument. The image of the emerging star, or whatever the phenomenon be, is thus made to appear in a different sector of the field according to the part of the second in which it occurs. On trial with a field divided into 20 sectors and an artificial star, one of the observers, without special practice, reduced his probable error for a single observation to about one fortieth of a second.

Ueber die galvanischen Erscheinungen in der Haut des Menschen bei Reizungen der Sinnesorgane und bei verschiedenen Formen der psychischen Thätigkeit. J. TARCHANOFF. Pflüger's Archiv, Bd. XLVI. pp. 46–55.

These experiments were made with the galvanometer of Meissner and Meyerstein, the deflections of the mirror being read off on a scale by means of a telescope. The instrument was so sensitive that the current in the N. ischiacus of the frog was sufficient to cause the scale to disappear from sight. The electrodes were applied to different parts of the body, principally to the outer surface of the hand and the inner surface at the base of the fingers. The currents of a state of rest were compensated for, and the subject was, of course, undisturbed and motionless. It was found that tickling was sufficient to cause a strong deflection of the needle. After a latent period of from one to three seconds, the current was at first weak and slow, and then so strong as to put the scale out of sight. The inside of the hand was negative, the outside positive. Electricity, heat and cold, the prick of a needle, caused the same effect, but not to such an extent. So did stimulation of the special sense-organs, the sound of an electric bell, the smell of vinegar and ammonia, the taste of sugar, etc. After the eyes had been closed for some time, simply opening them was sufficient to produce a current. Different effects were produced by different colors,—it is not stated what colors were the most irritating. But when no sensation was experienced, the mere imagination of a sensation was sufficient to produce a change of from 10 to 15 divisions on the scale. The idea of extreme heat was especially effective, and still more so if the hand, which was being tested was

alone imagined to be in a state of perspiration. Any strong intellectual exertion produced a marked effect, even when the needle no longer responded to excitations of organs of sense; but a simple application of the multiplication table was not very effective. The effect of any contraction of a muscle was very marked. DuBois-Reymond first showed that a current is produced in the hand when the hand contracts, but he attributed it to the negative variation in the current in the muscle. It seems now that Herrmann is right in considering it to be a secretory current produced by the increased activity of the sweat-glands, for it is produced in every part of the body where there are glands, no matter where the muscular contraction takes place, and it cannot be detected in places where the sweat-glands are few or wanting. It is not so much the extent of the voluntary motion which regulates the amount of the current as it is the degree of conscious exertion that accompanies it; to fixate the point of the nose, makes a change of twenty divisions on the scale. If both points of attachment of the electrodes are well supplied with sweat-glands, the current is frequently found to move first in one direction and then in the other; if one only is so, the current is negative at that end. The existence of this current indicates an increased activity of the sweat-glands; it is well known that their activity develops the so-called secretory current. It is therefore proved that the course of nearly every kind of nervous activity,—from the simplest impressions and sensations, to voluntary motions and the highest forms of mental exertion,—is accompanied by an increased activity in the glands of the skin. The plethysmographic investigations of Mosso, François Frank and others show that the blood-vessels of the extremities take part in all kinds of nervous activity. But they contract, and hence they are not the cause of the increased activity of the sweat-glands. That must be due to a special excitation of the nerve-centers which regulate them. Its purpose is plain; all nervous activity means an increased accumulation of the products of decomposition and a rise of temperature; the greater activity of the sweat-glands facilitates the elimination of the products of decomposition, and at the same time serves to bring down the temperature. C. L. F.

Untersuchungen über die Orientirung im Fühlraum der Hand und im Blickraum. J. LOEB. Pflüger's Archiv, XLVI, S. 1–46.

Loeb has made the important discovery that when we will to make equal excursions of the hand in the hand-space, the excursion actually executed is shorter than that willed, if the muscle concerned in making it is shorter than in a state of rest; and is longer, if the muscle is longer. The method of conducting the experiments was as follows. A person stands before a vertical table and makes with one hand, say the right, an excursion along a thread of definite length. At the same time he wills to move the left hand (which is not guided by a thread) over an exactly equal length: if this hand starts from a point higher up than the other and moves *upward*, it moves *less* than it should do; if it moves *downward*, it moves *more* than it should do. The more the starting-point of this hand is depressed (the hand which follows the string remaining at a medium height), the greater are its upward motions, the smaller are its downward motions; but the lower the starting-point, the longer are the muscles which raise the arm, the shorter are those which depress the arm. A simple experi-